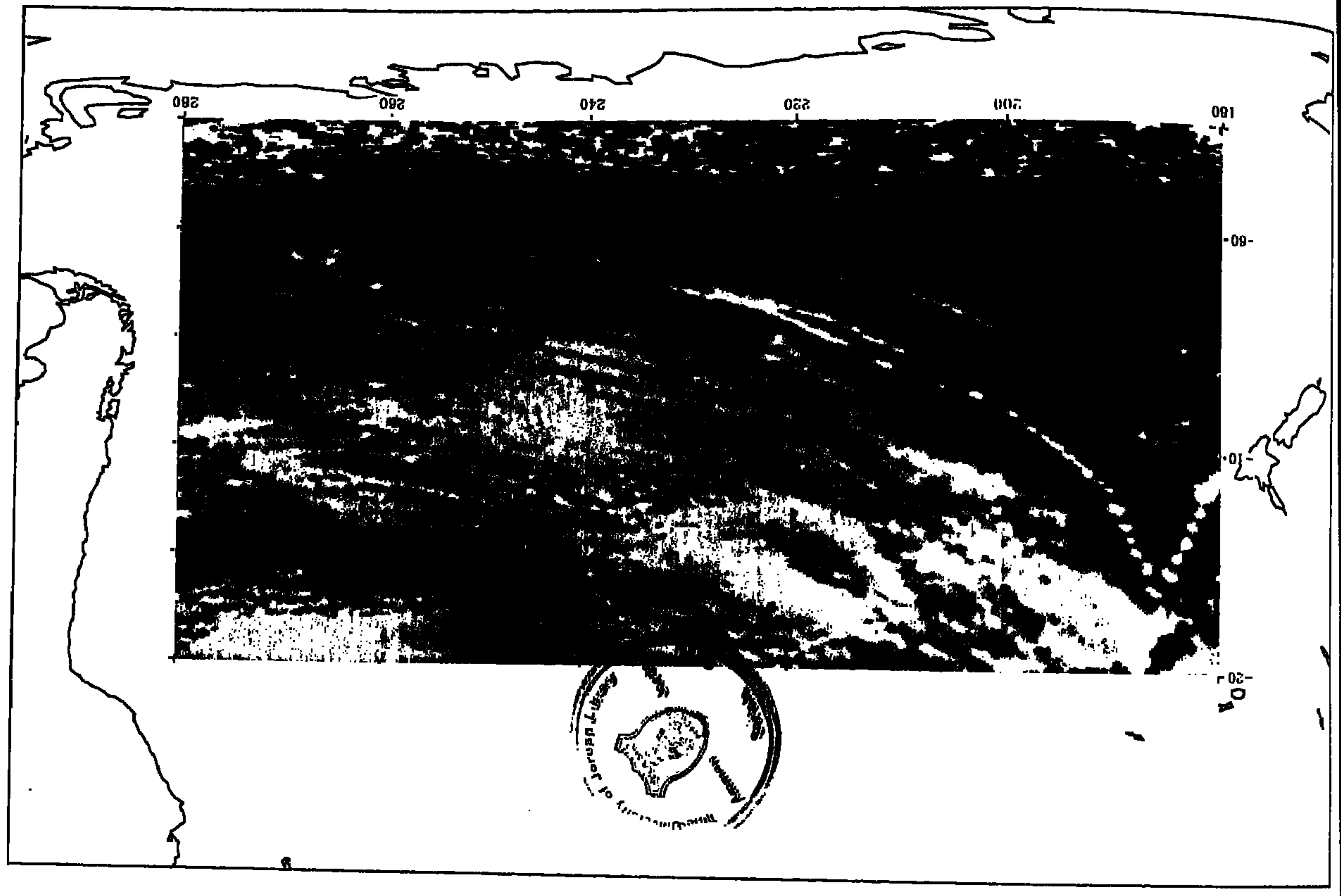

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News

In Congress

Independent NOAA Considered

A proposal to pull the National Oceanic and Atmospheric Administration (NOAA) out of the Department of Commerce and make it an independent agency was the subject of a recent congressional hearing. Supporters within the science community and in Congress said that an independent NOAA will benefit by being more visible and by not being tied to a cabinet-level department whose main concerns lie elsewhere. The proposal's critics, however, cautioned that making NOAA independent could make it even more vulnerable to the budget axe and would sever the agency's direct access to the President.

The separation of NOAA from Commerce was contained in a June 1 proposal by President Ronald Reagan that also called for all federal trade functions under the Department of Commerce to be reorganized into a new Department of International Trade and Industry (DITI).

Since its creation in 1970, NOAA has been part of the Department of Commerce; its budget is part of the larger Commerce budget and as such competes with the budgets of the department's other functions. If NOAA were to become independent, it is likely that the agency would do more than just change its home address. Most supporters believe that NOAA's mission would become better defined and that functions related to NOAA's missions but currently under other federal agencies would be added to the agency's turf.

On August 4, before Congress recessed for the summer, the Subcommittee on Oceanography of the House Merchant Marine and Fisheries Committee heard testimony from three former NOAA officials and from four representatives of oceanography advisory committees and organizations.

Of these witnesses, those supporting an independent NOAA were former NOAA Administrator Richard Frank; Terry Leitzell, former NOAA Assistant Administrator for Fisheries; Arthur Rocque, chairman of the Coastal States Organization; Clifton Curtis, representing the Coastal Alliance; John A. Knauss, chairman of the National Advisory Committee on Oceans and Atmosphere (NACOA); and B. J. Copeland, representing the National Association of State Universities and Land-Grant Colleges and the Sea Grant Association. Only Robert Knecht, former NOAA Assistant Administrator for the Office of Coastal Zone Management, shied away from heartily supporting the proposal.

Knecht cautioned that, "An independent agency, without a clearcut, broadly understood and supported national mission, is a sitting duck for all to pluck." Knecht acknowledged that independent agency status might increase NOAA's visibility and facilitate communication with Congress, constituencies, and the public; it also could symbolize a new emphasis, would likely attract and retain good people, and could be a way to compete more successfully for resources.

However, Knecht said the move could also be a step toward bureaucratic isolation, make the agency more exposed and vulnerable to the budget axe, and create a situation where the agency has trouble competing with cabinet-level departments on important issues. "Detaching NOAA to float alone on today's sea of program cuts, intense interagency competition, and general uncertainty without the momentum and protection offered by a set of strongly renewed national ocean goals, would be far too risky, in my judgment." Knecht currently is with the Marine Policy and Ocean Management Program at the Woods Hole Oceanographic Institution.

In the past year, oceanographers have called for a stronger oceanography leadership (*Eos*, July 5, 1983, p. 443) and have begun to set national oceanographic goals and to strengthen the science (*Eos*, February 22, 1983, p. 73; December 7, 1982, p. 1203; November 2, 1982, p. 835). In addition, two bills (H.R. 2853, S. 1238) are before Congress to establish a 15-member National Oceans Policy Commission that would make recommendations to Congress and to the President on a comprehensive national oceans policy.

Supporters of NOAA becoming an independent agency feel that NOAA's programs and budget would fare better out of the shadow of the Commerce Department. Because "NOAA's mission is largely irrelevant to the traditional mission of the Commerce Department . . . the marriage between NOAA and Commerce has been strained from the outset," stated Rep. Norman E. D'Amours (D-N.H.), chairman of the oceanography subcommittee, in his statement opening the hearing. "In recent years, with severe budgetary pressures, the relationship has grown increasingly unsatisfactory. Under Commerce's stewardship, NOAA has been first in line for cuts, last in line for administrative support," D'Amours added.

Expanding on these comments, Frank, NOAA administrator from 1977 to 1981, told the subcommittee that, in his judgment, "no compelling reason exists to keep NOAA in the Department of Commerce. This conclusion would be particularly true if the Department of Commerce were to focus even more than it presently does on trade . . . NOAA's missions would not benefit particularly from being under the jurisdiction of that department and a cabinet official whose main interests would correctly lie in another direction." Copeland from the Sea Grant Association added that, "Just as other federal agencies have been independently established to focus on national issues such as environment, space, and science, we need to establish a lead agency to focus on the ocean."

Also favoring NOAA as an independent agency is NOAA Administrator John V. Byrne. Although he did not attend the oceanography subcommittee hearing, Byrne, in a July 27 letter to oceanography colleagues, said, "A major advantage of independent status will be to place NOAA on an equal footing with other scientific and technical agencies . . . In the White House and OMB [Office of Management and Budget] decision processes, NOAA's programs and budgets will be considered along with those of other scientific and natural resource agencies. NOAA will also gain the freedom to bring issues directly to the White House when necessary."

A handful of bills to establish a new trade department and to create an independent NOAA have been introduced into the Senate and the House of Representatives (S. 121, S. 1723, H.R. 2630, H.R. 3381, H.R. 1202, H.R. 2288, and H.R. 3481). Congressional committees are expected to hear more testimony and to consider these bills when congressmen return to Washington next week. Among the other committees that are expected to participate in hearings are the Senate Foreign Affairs Committee's Subcommittee on International Operations and the House Governmental Affairs Committee.

An independent NOAA was first recommended in the 1969 report *Our Nation and the Sea* by the Commission on Marine Science, Engineering, and Resources, better known as the Stratton Commission, after its chairman, Julius A. Stratton. President Richard Nixon, however, did follow the Stratton Commission's recommendation to consolidate federal programs dealing with civilian atmospheric and oceanic concerns; the Commerce Department's NOAA is the product of that action. In 1979, NACOA advocated that NOAA be separated from the Commerce Department and become one of several agencies within the proposed (but rejected) Department of Natural Resources. In 1980, the Subcommittee on Oceanography of the House of Representatives' Merchant Marine and Fisheries Committee considered a recommendation to free NOAA from the Commerce Department; the proposal, receiving little support, was dropped.

President Reagan's proposal to form the Department of International Trade and Industry also reassigns the National Bureau of Standards to the National Science Foundation. The Minority Business Development Agency would be consigned to the Small Business Administration; and the Economic Development Administration would be placed in the Department of Housing and Urban Development. The destination of the Bureau of the Census has not been decided. Several alternative plans have been introduced into Congress.—*BTR*

Underwater Lab

The University of Southern California's Catalina Marine Science Center (CMSC) has announced plans to build an underwater marine reserch laboratory near Santa Catalina Island off the California coast. The project, which will take 2 years to build, will be sponsored by the National Oceanic and Atmospheric Administration (NOAA). The laboratory will be similar in concept to the U.S. Navy Sea Lab III, which was canceled some time ago.

The project's purpose is to give divers access to a laboratory without having to surface. The project leader, Andrew Pilmanis, of the University of Southern California, stated recently (*Industrial Research and Development*, July 1983): "By the nature of the work, scientists require a lot of bottom time, and to do it by scuba isn't practical. . . The only way to do that is with saturation diving. Once the diver is saturated with inert gas, whether the individual stays a few days or for months, only one decompression is required." Divers will typically stay in the laboratory for 7–10 days. The laboratory will initially be placed at a depth of 20 m, later to be refloated and located at depths to 37 m.

The plan is to build additional units as way stations to the main laboratory. Explained Pilmanis, "Each way station would be connected to the habitat by an umbilical so that the upper portion would be provided with low- and high-pressure air, communications, and power. The high-pressure air would be used to refill scuba tanks, and there would be a hot-water hose for replenishing the divers' hot-water suits. A diver will be able to work using scuba gear, or air hoses from the habitat or a way station. There's enough room in each way station for 3 to 4 people to stand up, with the upper part of their bodies out of the water from the waist up. Typically, the way stations will be placed 90–180 m from the habitat." This system will provide unusual flexibility because the way stations can be moved conveniently.

One objective of the submarine laboratory will be to assess the concept of relatively long-term functions of divers. Marine geology, biology, and oceanography projects will take precedence in the use of the laboratory. Engineering studies related to petroleum exploration and pipe lines will be accommodated as well.—*PMB*

Geophysical Events

This is a summary of *SEAN Bulletin*, *8*(7), July 31, 1983, a publication of the Smithsonian Institution's Scientific Event Alert Network. The Una Una report is an excerpt; the complete submarine volcano report is included. The complete bulletin is available in the microfiche edition of *Eos* as a microfiche supplement or as a paper reprint. For the microfiche, order document E83–008 at $2.50 (U.S.) from AGU Fulfillment, 2000 Florida Avenue, N.W., Washington, DC 20009. For the paper reprint, order *SEAN Bulletin* (giving volume and issue numbers and issue date) through AGU Separates at the above address; the price is $3.50 for one copy of each issue number for those who do not have a deposit account, $2 for those who do; additional copies of each issue number are $1. Subscriptions to *SEAN Bulletin* are available from AGU Fulfillment at the above address; the price is $18 for 12 monthly issues mailed to a U.S. address, $28 if mailed elsewhere, and must be prepaid.

Volcanic Events

Una Una (Indonesia): Pyroclastic flows devastate island; clouds to stratosphere; evacuations prevent large death toll
Gamalama (Indonesia): Ash ejection; several thousand evacuated
Veniaminof (Alaska): Lava flow melts large pit in caldera ice, then eruption weakens
Kilauea (Hawaii): Lava flows move ENE along east rift for 4 days
Mount St. Helens (Washington): Lava dome growth continues; plumes emitted
Long Valley (California): New collapse pits and fumarole
Piton de la Fournaise (Réunion Is.): 12-hour earthquake swarm
Etna (Italy): Eruption ends after 4 months of lava extrusion
Langila (New Britain): Explosions; ashfalls; strong harmonic tremor
Manam (Bismarck Sea): Moderate ash, vapor emissions; B-type events continue
Ulawun (New Britain): Strong seismicity but no change in plume
Submarine volcano (New Britain): Earthquake swarm; sounds and glow
Kusatsu-Shirane (Japan): Small plume emitted; volcanic tremor; A-type events
Sakurajima (Japan): Explosions, tephra emission, and seismicity
Sangay (Ecuador): Eruption continues with ash emission every 10 minutes
Atmospheric Effects: El Chichón aerosols weaken gradually; new layer sometimes present near tropopause

Una Una Volcano, Sulawesi, Indonesia (0.17°S, 120.61°E). All times are local (= UT + 8 hours). An explosive eruption produced pyroclastic flows that destroyed most homes, vegetation, and animal life on 40 km² Una Una Island and probably injected tephra into the stratosphere. Initial activity prompted evacuation of everyone on the island before the devastating explosions.

The eruption was preceded by seismicity that increased from 9–11 felt events per day on July 8 to 30–40 per day on July 15. The number of recorded events was 33 on July 14, increasing on following days through 49, 53, and 73 to an average of more than 90 per day July 18–21. The strongest earthquake was felt 400 km away on July 18. That morning, a 1-km column of ash and incandescent material was ejected. Agence France Presse reported that a strong explosion occurred July 19, and thick gray clouds containing incandescent tephra were visible from Ampana, more than 100 km to the south, the next day. By July 20 almost all houses and buildings in the eight villages near the volcano had been destroyed, and nearly half of the residents of the island had been evacuated. All had left by the time of a major explosion on July 21 at 1028 that subjected 80% of the island to temperatures of up to 200°C. Tephra as large as 5–10 cm in diameter fell near a Volcanological Survey of Indonesia observation vessel and the monitoring team reported flames on parts of the island. A government geologist estimated that all 700,000 coconut trees and all livestock on the island must have been burned, probably by pyroclastic flows. Ash darkened much of the region and people in Palu, 250 km away, were forced to protect themselves from ashfall until late on July 23. A Volcanological Survey of Indonesia field party arriving on the island July 22 at 0100 felt 10 earthquakes during their 15-hour stay and observed a 1.5-km eruption column at 1649.

On July 23 at 2055 a British Airways jet (en route from Singapore to Perth) flying at 10.6 km altitude encountered an eruption cloud at 1.4°S, 120.71°E, about 150 km S of Una Una. Pilots noted a volcanic smell, lack of visibility, and St. Elmo's Fire around the windshield. The aircraft returned immediately to Singapore and suffered no damage.

Extensive weather clouds obscured the area from satellite observation until July 24. That day at 1930 a satellite image showed a cloud about 120 km wide extending about 600 km S from Una Una. Press reports quoted a local government official who said that 80% of the island was covered by volcanic clouds on July 24, burning vegetation and destroying trees. On July 26 at 0000 the Japanese GMS satellite showed what appeared to be a dense eruption column rising from the island. On the next image 2 hours later a fan-shaped plume was visible, probably in or near the stratosphere. High-altitude material was blowing to the SW and W while low- and mid-level debris was drifting slowly S to SSE. On July 28 at 0200 the GMS satellite showed a small plume over the island. By 1100, vigorous activity fed a cloud that reached 118°E and at least 13.5 km altitude. At 1400 the plume stretched about 500 km to the WSW and was very dense within 250 km of the volcano. Temperatures and wind directions at the tropopause were consistent with the plume's direction of movement and coldest temperature (-76°C) as determined from a NOAA 7 image at 1430. By the next image at 2000 the plume had dissipated. The GMS satellite showed the beginning of another eruptive episode on July 30 at 1630. At 2000, a NOAA 7 image contained a WSW-drifting plume similar to the one on July 28 but not as spectacular. It extended from the volcano about 200 km SW and W on July 31 at 0200 but was dissipating 3 hours later. Another explosive episode first appeared on the imagery August 2 at 0500. Before activity ended at 1700 a plume had moved about 200 km to the SW and reached roughly 9–12 km altitude. A dense eruption column appeared over the island August 3 at 0000 and extended roughly 120 km to the W and SW 2 hours later. The plume was relatively diffuse and appeared to have reached only the mid-troposphere. Satellite images indicated that another explosion started August 4 at about 1000, feeding a plume that moved about 350 km to the NNW. This plume probably remained in the troposphere. Agence France Presse reported an eruption on August 9 at 0835 that ejected a gray plume to 3 km. No activity was evident on satellite images until August 12 at 0130, when a plume was present that was not visible 2 hours earlier. At 0300 NOAA 7 data showed a dense plume similar to that of July 28 extending about 300 km SW to central Sulawesi.

Una Una's only known previous historic eruption occurred from its crater lake in 1898, producing mudflows and more than 10^7 m³ of tephra.

Information Contacts: Adjat Sudradjat, Volcanological Survey of Indonesia, Dipone-

News (*cont. on p. 540*)

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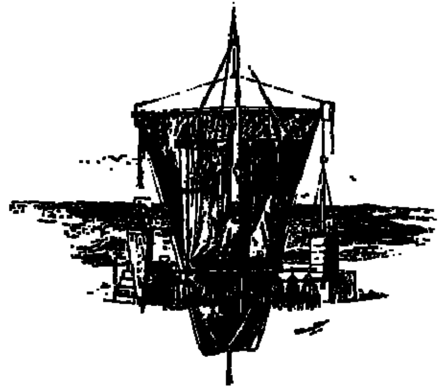

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Editor: Arnold L. Gordon, Lamont-Doherty Geological Observatory, Palisades, NY 10964 (telephone 914-359-2900, ext. 325).

Coastal Ocean Dynamics

*The CODE Group**

Introduction

The main objective of the Coastal Ocean Dynamics Experiment (CODE) is to observe and describe the response of continental shelf waters to strong atmospheric forcing in a relatively simple geomorphological setting. In order to achieve this goal, CODE has been designed (1) to define the different space and time scales of the physical parameters important to the shelf flow field and (2) to identify and describe the essential kinematical and dynamical processes governing wind-driven circulation on the continental shelf.

A variety of models exist for the wind-forced response of continental shelf waters. The salient differences among these models lies in the assumed balances between terms in the governing equations. For example, *Gill and Schumann* [1974] in a barotropic model assume a geostrophic cross-shelf momentum balance but include the time-dependent and surface and bottom stress terms in the alongshelf momentum balance. *Csanady* [1978] in his arrested topographic wave model involving bottom friction assumes a quasisteady alongshelf response neglecting advective terms and retaining the geostrophic cross-shelf balance. Various shelf wave models assume inviscid dynamics and other models assume a simple balance between surface and bottom stress in shallow water. To test the different assumptions behind these models, all terms in the governing equations need to be accurately estimated.

The design of an experiment to estimate each term is no simple task. To see this, consider the vertically integrated horizontal momentum equation

$$<u_t> + <u \cdot \nabla u> + <f \times u> = - <\frac{1}{\rho}\nabla p> + \frac{(\tau_s - \tau_b)}{\rho h}$$

where the angle brackets indicate the vertical integral of the variable within the angle bracket divided by h, the local water depth. The estimation of different terms in this equation necessary to establish the dominant terms requires the observation of the current u, of its derivatives in time and in space, of the pressure (or, actually, the pressure gradient), and of surface and bottom stresses. Of these terms, only the current field can be directly observed. Other terms involving gradients of the current or pressure fields require differencing of direct observations, and surface and bottom stress must be estimated from wind and current measurements by indirect methods. Accurate estimation of gradients requires both accurate measurements of the individual variables and a detailed knowledge of the structure of the flow field, or at the very least, of the coherent length scales of the flow. Accurate estimation of stress terms requires either the use of verified constitutive relationships between velocity and stress or very careful application of direct measurement techniques, all of which are difficult to use in the field.

In spite of the inherent difficulties involved, the CODE principal investigators agreed that an experimental program which would provide new descriptions of the physics of wind-driven flow could be designed using recently developed methodology and technology. The components of the resulting measurements program are described in Table 1. Two densely instrumented small-scale field experiments of roughly 4 months' duration and spaced 1 year apart were designed to explore the kinematics and momentum and heat balances of the local wind-driven flow over a region of the northern California shelf. A more sparsely instrumented, long-term, and large-scale component was designed (1) to help separate the local wind-driven response in the region of the small-scale experiment from motions generated either offshore by the California current system or in some distant region along the coast, and (2) to help determine the seasonal cycles of atmospheric forcing, water structure, and circulation in the CODE area.

The first small-scale experiment, CODE 1, was conducted between April and August 1981 and was designed as a pilot study with primary emphasis on characterizing both the wind-driven "signal" and the "noise" from which this signal must be extracted. In particular, CODE 1 was designed to identify the key features of the circulation and its variability over the northern California shelf and to determine the important time and spatial scales of the wind-driven response. We will present here an overview of CODE 1 and some of its preliminary results that had a significant influence on the design of the second small-scale experiment, CODE 2. The program is now entering the analysis and synthesis phase and thus we anticipate publication of the major results from CODE over the next few years.

Site Selection

The site selected for the CODE small-scale experiments is a region of the continental shelf north of San Francisco extending from Point Reyes north to Point Arena (Figure 1). This section of the California coast is characterized by simple bottom topography and large wind-stress fluctuations during both winter and summer. The monthly mean wind stresses in this region are the largest on the West Coast [*Nelson*, 1977]. More important, the fluctuating wind stress exhibits large variability on time scales of several days, superposed on a strong annual cycle that consists of general south and southwestward (upwelling-favorable) winds in the spring and summer and strong variable winds in the winter.

The middle and outer shelf in this region has a mud/silty-sand bottom and is generally characterized by an absence of large-scale bedforms; hence relatively well-behaved near-bottom flow was expected and found in CODE 1. This condition was necessary to simplify the interpretation of point measurements of bottom stress. Finally, the proximity of adequate port and laboratory facilities in San Francisco and Bodega Bay, California, and Newport, Oregon, combined with the use of a dedicated research vessel, the R/V *Wecoma*, simplified the logistics in the study of this region.

CODE 1

The major observational elements in CODE 1 included (1) moored arrays instrumented to measure wind velocity, air temperature, solar radiation, current velocity, water temperature, conductivity, bottom pressure, and near-bottom flow for estimating bottom stress, (2) shipboard observations of temperature, conductivity, current velocity, wind velocity, and surface fluxes, (3) aircraft observations of wind velocity, estimates of wind stress, sea surface temperature, surface drifter motion, and atmospheric parameters, (4) surface drifters tracked from shore and by aircraft, (5) CODAR, a shore-based high frequency radar system used to map the surface current pattern near the central mooring line, (6) satellite imagery consisting of sea surface temperature and Coastal Zone Color Scanner (CZCS) data, and (7) coastal and environmental buoy measurements of wind, atmospheric pressure, and sea level.

TABLE 1. CODE Principal Investigators

Investigator and Affiliation	Research Area
J. Allen, OSU	Large-scale atmospheric pressure, winds, and coastal sea-level observations.
A. Huyer, OSU	Hydrography.
R. Davis/C. Winant, SIO	Small-scale current and temperature measurements, Lagrangian flow measurements, shipboard current measurements, and satellite data.
W. Brown/J. Irish, UNH	Bottom pressure measurements, density chain and upward Doppler profiler development.
W. Grant/A. Williams III, WHOI; D. Cacchione/D. Drake, USGS	Bottom boundary layer studies, bottom stress measurements, swell and wind-wave climate, bottom topography and geology.
R. Beardsley, WHOI	Long-term current and temperature observations, small-scale buoy wind measurements, overall program coordination.
C. Friehe, NCAR/U. C. Irvine	Aircraft measurements of wind, wind stress, and planetary boundary layer structure.
M. Janopaul/S. Frisch, NOAA	CODAR surface-current measurements.

*The Coastal Oceans Dynamics Experiment (CODE) was originally conceived by the following principal investigators (who collectively make up the CODE Group): J. Allen, R. Beardsley, W. Brown, D. Cacchione, R. Davis, D. Drake, C. Friehe, W. Grant, A. Huyer, J. Irish, M. Janopaul, A. Williams, and C. Winant.

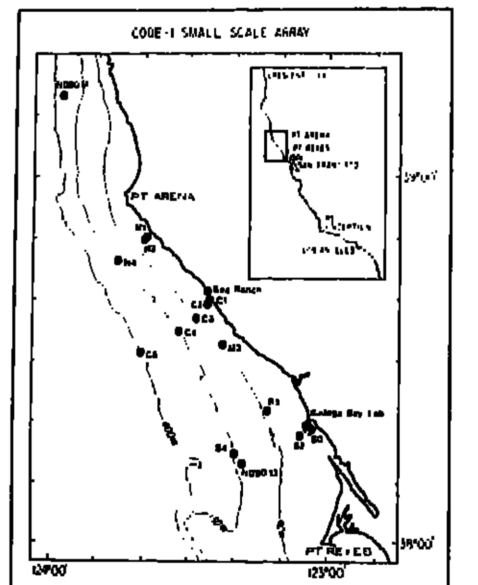

Fig. 1. Array design for first small-scale experiment, CODE 1. Insert shows location of array along U.S. west coast.

The moored current meter program deployed a T-shaped array of instrumented moorings to examine the vertical and horizontal structure of the current field over the shelf. The array consisted of a five-element cross-shelf transect and a three-element subarray deployed along the 90 m isobath. Previous observations suggested that the vertical structure of currents was likely to change most rapidly in a cross-shelf direction and thus the central line located off Stewart's Point near Sea Ranch (see Figure 1) was most heavily instrumented with moorings deployed in depths of 30 m (C1), 60 m (C2), 90 m (C3), and 130 m (C4) on the shelf and in 400 m (C5) depth on the adjacent slope. A multielement array of bottom pressure and temperature instruments was also deployed to measure local pressure field fluctuations in both the cross-shelf and alongshelf directions. A schematic of the CODE 1 moored array is depicted in Figure 2.

Preliminary Results

The Wind Field

On March 26, 1981, the lower atmosphere over the eastern Pacific underwent a rapid and large-scale change resulting in the establishment of the North Pacific High. Locally the strong fluctuating winds, which characterize the winter season, gave way within a day or so to the more steady upwelling-favorable wind regime which characterizes the spring and summer season along the central and northern California coast. This transition in atmospheric forcing can be seen in the time series of alongshelf wind observed at the coast at Sea Ranch shown in Figure 3.

During CODE 1, the near-surface winds were observed at several sites over the shelf using meteorological buoys, and the time series of alongshelf wind measured at midshelf at C3 is also shown in Figure 3. During this period the mean winds over the shelf were directed southeastward (downcoast), which is favorable for upwelling. The relatively steady downcoast winds were interrupted for periods of 2 to 5 days by a series of fronts or other disturbances which caused the local winds to weaken or reverse. Between these periods of weak or upcoast wind, the wind field over the shelf was directed parallel to the coast and was usually relatively strong, with speeds varying between 15 and 20 m s^{-1} at buoy height.

In addition to the limited array of coastal and moored meteorological stations, the spatial structure of the wind field was also investigated with the help of an NCAR aircraft which made repeated overflights of the CODE area [*Friehe and Winant*, 1982]. Aircraft soundings indicate that the strong winds observed over the shelf in the CODE region were confined to the marine boundary layer which was usually capped by a sharp temperature inversion located between 50 and 300 m altitude. The vertical profile of the wind over the shelf was similar to that of a wall-jet flow with maximum velocities (typically 22–25 m s^{-1}) occurring in the inversion layer. Synoptic maps of the wind velocity observed at 33 m with the aircraft show that the wind varies strongly in the horizontal plane with sharp changes in the amplitude of the wind velocity over scales of a few kilometers in both the alongshelf and cross-shelf directions. These variations were intensified by the diurnal seabreeze which is steered by the coastal mountain range and trapped in a nearshore band. The two time series of alongshelf wind presented in Figure 3 give some sense of the spatial structure of these fluctuations. Although the variations in wind are well correlated between Sea Ranch and C3, some important differences exist. For instance, in the strong upwelling period which lasted from April 29 to May 13, the wind was initially stronger at Sea Ranch than at C3, but after May 5 the wind at Sea Ranch became notably weaker than at C3.

The Temperature Field

The vertical structure of the temperature field over the inner shelf is shown in Figure 3 by the five time-series of temperature observed at different depths through the water column at C2 in 60 m. The most dramatic change in the thermal field occurred at the very beginning of the observation period. Before March 27 the water temperature over the shelf varied from slightly above 10°C near the bottom at 13°C near the surface. As a result of the onset of the upwelling-favorable wind regime associated with the North Pacific High, the water cooled at all depths over the shelf, reaching temperatures on the order of 7–8°C, and the temperature difference across the water column was reduced from 2–3°C before the transition to less than 1°C during southeastward winds. This response is part of (or characterizes) the winter-spring transition described off Oregon by *Huyer et al.* [1979]. Repeated hydrographic sections made during the experiment after this transition have been averaged and show that temperature generally increases with distance from shore at all depths over the continental shelf, and that bottom waters are nearly uniform across the shelf (Figure 4). The temperature variability is strongest at the sea surface.

The shelf wind and temperature time series shown in Figure 3 exhibit a clear correlation between cooling and downshelf wind fluctuations. When the upwelling-favorable alongshelf wind ceases, water temperature increases rapidly over the inner shelf and more slowly offshore. This tendency is most notable in early July when, during a 1-week period of weak winds, the near-surface temperatures rose to 12°C and the vertical temperature difference at C2 increased to nearly 2°C. Satellite and aircraft observations suggest that warm water found nearshore during wind relaxation events originates in the surface waters south of Point Reyes. Hydrographic data show that warm water also occurs offshore [*Olivera*, 1982]. Satellite observations also show a tendency for cold water jets, apparently flowing offshelf, to originate near Point Arena and Point Reyes.

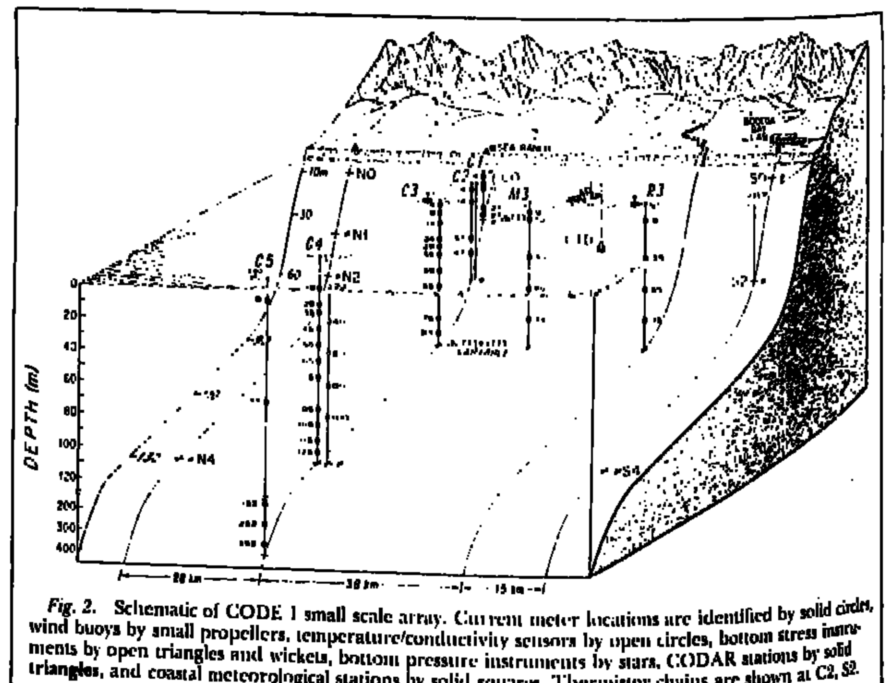

Fig. 2. Schematic of CODE 1 small scale array. Current meter locations are identified by solid circles, wind buoys by small propellers, temperature/conductivity sensors by open circles, bottom stress instruments by open triangles and wickets, bottom pressure instruments by stars, CODAR stations by solid triangles, and coastal meteorological stations by solid squares. Thermistor chains are shown at C2, S2.

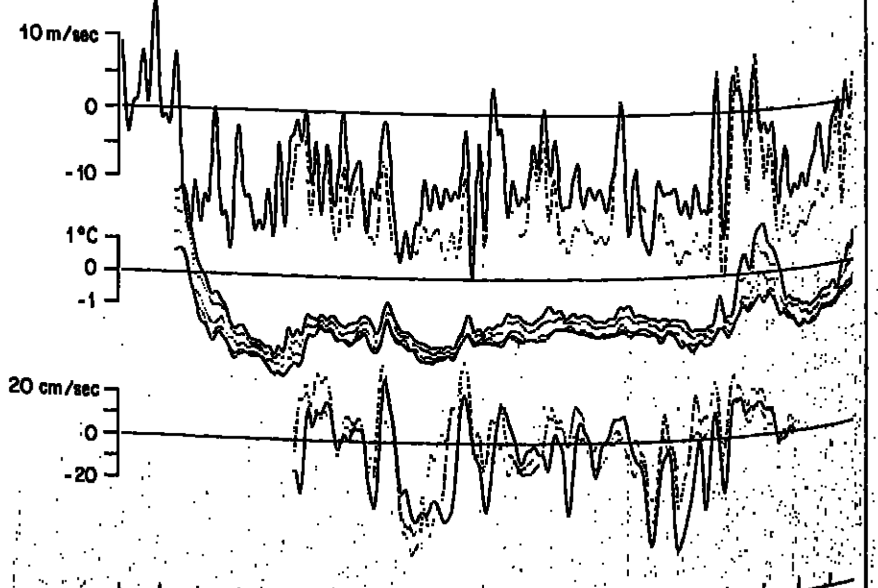

Fig. 3. Composite plot of time series of alongshelf wind at Sea Ranch (solid line) and C3 (dashed line) in top plot; temperature at five equally spaced depths between 10 m and 55 m in 63 m depth at C2 in middle plot; and the amplitude of the principal empirical orthogonal velocity modes at C3 (solid line), M3 (dashed line), and R3 (dotted line) along the 90 m isobath in the bottom plot. Tick marks on time axis are separated by one week. The wind and temperature data have been low-pass filtered (half-power point 38 hours) and the empirical modes computed using low-pass filtered velocity data.

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Cover. Reflected light photomicrograph of euhedral graphite crystals in the Antarctic ureilite, ALHA78019. Scale line represents 250 μm. This high-power view shows graphite crystals (elongate diagonal, medium gray) intergrown with terrestrially oxidized Fe-Ni metal (light gray; bright blebs are remnant metal areas), both phases (graphite plus metal) are filling interstices between two distinct olivine grains (dark gray). Pyramidal terminations occur on some graphite crystals (especially small grain, center) and (0001) cleavage is apparent in many grains. Graphite is believed to originate in these meteorites by exsolution from a C-saturated metallic phase during igneous cooling (see J. L. Berkley and J. H. Jones, Primary igneous carbon in ureilites: Petrological implications, Proc. Lunar Planet. Sci. Conf. 13th, in *J. Geophys. Res.*, *87*, A353–A364, 1982). ALHA78019 is the only ureilite (of 15 known individuals) that displays relatively undeformed crystalline graphite. Graphite in all other ureilites is highly shocked and is observed as a black, chaotic melange intergrown with metal, sulfides, shattered silicate materials, and, generally, shock-produced, micron-sized diamonds. Diamonds were not observed in ALHA78019, further attesting to its relatively low-shock, pristine nature. (Photo courtesy of J. L. Berkley, Department of Geology, State University College, Fredonia, New York 14063)

The Current Field

The mean cross-shelf and alongshelf currents observed at each site over the common period April 15 to June 30 exhibit strong vertical shear (Figure 5). The near-surface mean currents are directed downcoast with an amplitude of 17 cm s^{-1} at 4 m at C3, while the deeper mean currents are generally weaker. The vertical shear in the mean alongshelf current was consistent in a geostrophic sense with the mean cross-shelf density structure as determined from CTD sections (see Figure 4).

One central objective of CODE is to identify and describe the wind-driven component of shelf circulation and to isolate that component from other subtidal phenomena. Current spectra for CODE 1 typically exhibit two significant peaks in energy, a relatively sharp peak near 1 cpd associated with the seabreeze and diurnal tide and a broader, 6-day peak. The spectra of surface wind stress exhibit the same kind of structure. The 6-day synoptic-scale current fluctuations were the strongest and were highly polarized in the alongshelf direction. The alongshelf component of the flow fluctuations was coherent over the entire water column at all mooring sites over the shelf and was correlated with the fluctuations in the alongshelf wind field. The standard deviations of the depth-integrated, subtidal, alongshelf and cross-shelf current components are shown in Figure 5 to illustrate the horizontal structure of the subtidal shelf flow, which is characterized by a maximum amplitude near midshelf at C3 with decreases both offshore over the outer shelf and inshore towards the coast.

Additional information on the spatial and temporal structure of the current field over the shelf is provided by the empirical orthogonal modes of the subtidal currents at each mooring site. Over the shelf, the two largest eigenmodes account for over 90% of the subtidal variance, and over the midshelf and inner shelf at depths less than 100 m, the largest eigenmode by itself accounted for over 90% of the variance. The vertical structure of the largest eigenmode at each site (see Figure 5) is dominated by the alongshelf component, which exhibits little vertical shear. Time series of the largest eigenmode at each site show that the eigenmodes are coherent with each other over the shelf and with the alongshelf component of wind at C3. In contrast, off the shelf at C5, the largest eigenmode at C5 accounts for only 55% of the subtidal variance and is not correlated with the shelf eigenmodes or local wind. The time dependence of the principal eigenmodes observed at the alongshelf subarray formed by C3, M3, and R3 on the 90 m isobath is shown in Figure 3. Current fluctuations are significantly correlated over the length of the experiment and coherent with variations in the alongshelf wind at C3; however, important differences in amplitude and phasing exist. While the midshelf currents seem to accelerate uniformly downcoast when the wind begins to blow downcoast, the response to decelerating wind is more complex. For example, during the April 29–May 12 upwelling episode, the current first reversed towards the north on May 8 at R3, on May 9 at M3, and on May 11 at C3. There was thus a period of 1 to 2 days of strong convergence in the alongshelf flow field, which by continuity suggests that strong currents in the offshelf direction may occur occasionally.

Surface drifters provide additional evidence of both strong offshelf flow events and significant alongshelf variability. Several examples of offshore velocities greater than 30 cm s^{-1} persisting for days were observed. It was also found that the Lagrangian time scale is less than the Eulerian time scale, most of the variability energy is incoherent between sites separated by more than 15 km, and the resulting lateral Lagrangian diffusivity exceeds 1000 m^2 s^{-1}. Figure 6 is an example of seven trajectories of buoys released on July 4 and tracked for 4 days; these are superimposed on the satellite-derived sea surface temperature map for July 6. Four inshore drifters moved downcoast and then offshore in a large, cold-water plume while three drifters released farther offshore were entrained into a cyclonic cold-core eddy.

The Near-Bottom Flow Field

During CODE 1, an array of bottom tripods was used to measure the near-bottom velocity field over the lower 2 m for the purpose of estimating bottom stress. Supporting geological investigations of bottom roughness were carried out using side-scanner sonar, precision echo sounding, bottom photography and box coring. The main objective of this program was to resolve both the temporal variability in the magnitude of the local (spatial averages over a kilometer scale) bottom stress field and the cross-shelf variability in the local stress fields, quantities which are required to make dynamical balances of the shelf momentum field.

A well-mixed, near-bottom region was found imbedded in a stratified bottom boundary layer. The bottom flow field exhibited the same variable velocity characteristics as the shelf flow described above. Thus, the bottom stress varied in both direction and amplitude during the course of the experiment. The magnitude of the local stress was found to depend primarily on the relative strength of the mean flow field and the near-bottom oscillatory velocities induced by swell associated with storms in the southern Pacific. These long period swell interact with the bottom over the entire shelf and have typical mid-shelf near-bottom velocities comparable with the near-bottom mean currents. The waves cause an enhancement of the local bottom stress due to nonlinear, wave-current interaction. The physical implications of this result are important in that the bottom stress magnitude and cross-shelf variability are significantly larger than values predicted by the standard constant drag quadratic stress law.

The Pressure Field

On the basis of preliminary pressure observation results, it is clear that alongshelf pressure gradients are measurable and exhibit an increase in variance onshelf and alongshelf (towards the northwest). To what extent this variability is part of the local wind-driven response is not yet determined. Still other questions regarding the current, temperature, and pressure variability await detailed examination of the influence of remote regions both on and off the shelf. A full analysis of the large-scale array data set will provide answers to some of the questions.

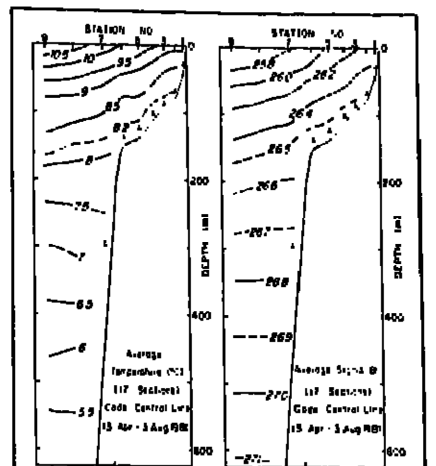

Fig. 4. The mean temperature and sigma-theta distributions along the CODE central line from 17 CTD sections between April 13 and August 3, 1981.

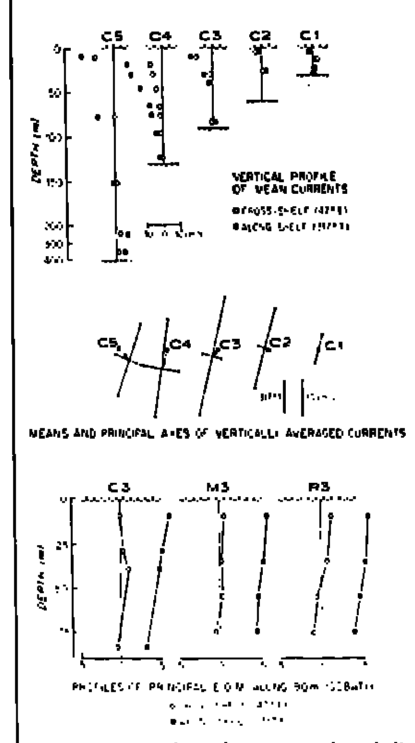

Fig. 5. Vertical profiles of mean alongshelf and cross-shelf currents at moorings C1 to C5 along the central line are shown in the top panel, vector plots of the mean and principal axes of the vertically-averaged currents along the central line are shown in the middle panel, and vertical profiles of the principal empirical orthogonal mode computed from the low-passed current data at the three 90 m moorings, C3, M3, and R3 are shown in the bottom panel.

Large-Scale Coastal Sea Level and Wind Field

Observations of the sea level and winds from stations along the entire U.S. west coast have been collected to provide information on the large-scale (alongshore) aspects of the coastal response to atmospheric forcing. Wind fields calculated from surface atmospheric pressure analyses [*Bakun*, 1973] are also being utilized and compared with measured winds. Initial results show that consideration of large scale effects of the wind forcing are important for understanding the behavior of the current fluctuations in the CODE region. This is shown qualitatively, for example, by the contour plots of adjusted sea level and alongshelf wind stress as a function of time and alongshore coordinate in Figure 7. The relatively large drop in coastal sea level near the CODE site during June 13 (associated with the simultaneous southward fluctuation in alongshelf current shown in Figure 3) is evidently forced by a southward wind-stress fluctuation with maximum amplitude centered about 500 km south and occurring on June 12. The alongshore scales of these disturbances correspond roughly to half wavelengths of about 1000 km. Note that no exceptional southward winds were observed during this period at C3 on the CODE central line (Figure 3). This general behavior of maximum response of sea level (and alongshelf currents) occurring north and later in time than the wind stress maximum is borne out by statistical calculations and is in agreement with results of theoretical models (e.g., *Gill and Schumann*, 1974) where it derives from the waveguide nature of the continental margin to northward propagating, subinertial frequency, coastal trapped waves.

CODE 2

In view of the high vertical coherence but lower-than-expected horizontal coherence found between current fluctuations observed over the shelf in CODE 1, the second small-scale experiment, CODE 2, was designed with reduced vertical but increased horizontal sampling. The resulting moored array shown in Figure 8 contained three cross-shelf transects of current meter moorings deployed at depths of 60 m, 90 m, and 130 m. The three transects were separated by approximately 29 km. Current measurements were not made over the very narrow inner shelf at depths less than 60 m since the subtidal currents observed there in CODE 1 were quite weak. In addition to the mesoscale variability observed along the 90 m isobath between C3 and R3 in CODE 1, hydrographic data, satellite sea-surface temperature data, and drifter data all suggested that the bend in the shelf geometry at Point Arena may reduce the continuity of the alongshelf flow around Point Arena. Therefore, several additional current-meter moorings and a single, bottom pressure/temperature instrument were deployed north of Point Arena to examine the alongshelf coherence around this headland.

CODE 2 was conducted between March and August 1982; all of the instrumentation deployed was recovered and the overall data return was excellent.

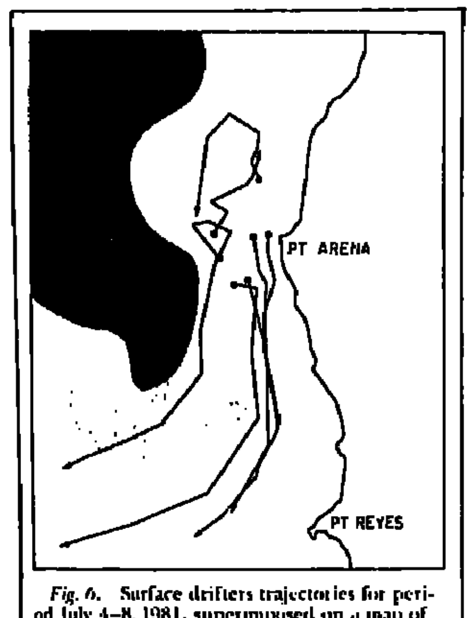

Fig. 6. Surface drifters trajectories for period July 4–8, 1981, superimposed on a map of sea surface temperature for July 6 derived from the NOAA-infrared observations (courtesy K. Kelly).

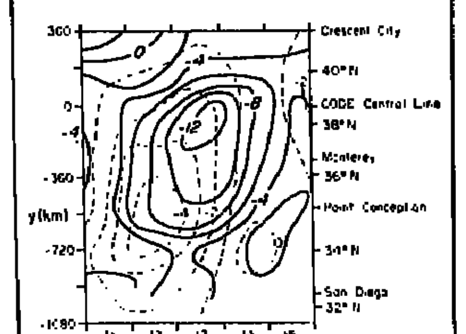

Fig. 7. Contours of adjusted sea level in cm (solid lines) and alongshore wind stress in dyn cm^{-2} (dashed lines) as a function of time and alongshore coordinate for the period of June 11–15, 1981. The wind stress is calculated from six hourly surface atmospheric pressure analyses [*Bakun*, 1973]. Both wind stress and sea level are low-pass filtered (half power point 40 hours) and interpolated to a regular alongshore grid with spacing 180 km.

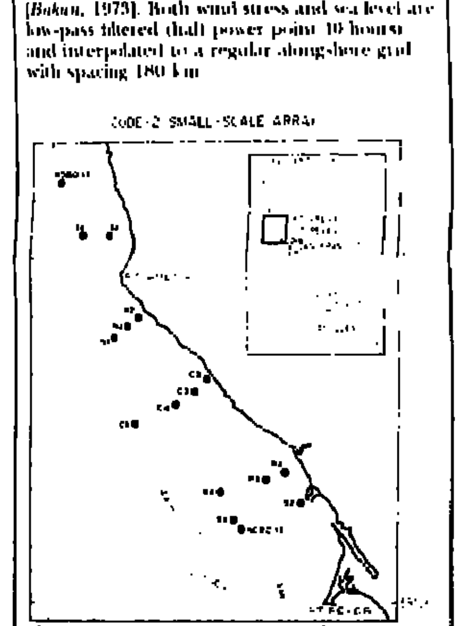

Fig. 8. Array design for CODE 2, the second small-scale experiment.

The CODE program is now entering the data analysis and synthesis phase. A preliminary description of the CODE 1 field program is in *Allen et al.* [1982] and a sequence of technical and data reports are now being published. A list of these reports and copies of them are available from Program Coordinator R. C. Beardsley, Woods Hole Oceanographic Institution, Woods Hole, MA 02543.

Acknowledgment

Primary support for CODE has been furnished by the Ocean Sciences Division of the National Science Foundation. Additional support has been provided by the National Aeronautics and Space Administration and Office of Naval Research.

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Oceanography (cont. on p. 540)

Oceanography *(cont. from p. 539)*

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News & Announcements

Ocean Sciences Award

Richard C. Vetter

The Ocean Sciences Section of the American Geophysical Union wishes to recognize the outstanding contributions made by Richard C. Vetter. He will, at the end of June, complete a long and outstanding tenure at the National Academy of Sciences. We are told that Dick has actually served at the Academy for more than 25 years, but we find this hard to believe! Dick has served as the principal, and almost always the only, staff officer to the early Committee on Oceanography (known as NASCO); the Ocean Affairs Board; and the Ocean Sciences Board. Now the Academy is going through another of its almost patented reorganizations and, as a result, Dick is moving on. He will be missed by all of us and by his colleagues in other countries as well.

Dick was responsible for the planning, organization, and follow-up of Academy meetings and workshops too numerous to mention. Dick's efforts were instrumental in enabling the Academy, as a result of these activities, to make recommendations to the federal government regarding the future funding of ocean sciences; the organization and structure of the federal government's oceanographic effort; the development of improved ocean science facilities, including the academic fleet; the development of the marine science provisions of the UN Law-of-the-Sea Treaty; and other important issues.

Dick has long been a strong advocate of the Scientific Committee on Ocean Research (SCOR). He has staffed the U.S. National Committee for SCOR and actively participated in SCOR activities as well. He has arranged for U.S. scientists to serve on SCOR working groups and to participate in other SCOR activities, such as the Joint Oceanographic Assemblies. Dick has been actively involved in strengthening SCOR and enabling it to provide sound direction to major new international oceanographic research programs, including the International Decade of Ocean Exploration and its component activities, such as MODE, NORPAX, GEOSECS, CUEA, etc.

It's not easy to get blood from a turnip, but Dick's efforts to extract funding from up to 10 different federal agencies to support the Academy's ocean science activities have probably been even more difficult. Yet, because of his excellent relations with these agencies, developed over many years; because of his skills in administration and management; and because of his thorough understanding of oceanographic research, Dick has been able to obtain for the Academy the financial support so necessary for its ocean science activities.

Throughout his tenure at the Academy, Dick has worked with all of our biogeopolitical oceanographers—sometimes with 10 or 15 of them in the same room at the same time. The impact on Dick's blood pressure as a result of these meetings can only be imagined! Trying to get the Ewings, Ketchums, the Revelles, the Woosters, etc., to agree on major issues is a task we certainly don't envy. Yet, Dick managed to do this and throughout maintained a warmth and a humor in dealing with his constituency. He published the periodical newsletters describing the activities of his office and the rises and falls of the members of the clan. He peppered this offering with the "tloodles" of the great and the near great, doodles that were made at the meetings of marine scientists who were his associates. These doodles tell a great deal about the artists that made them; they will remain an important heritage of U.S. marine science in the second half of the 20th century.

Many of us will remember Dick as the "personified tickler," but a tickler with style. Our priorities have sometimes forced us to set aside our obligations to the National Academy of Sciences and the National Research Council. Dick, in his notes, would remind us of our commitments—usually in a delightful way that encouraged us onward and upward.

Dick has a sense of recall which has served us all well at our meetings and conferences. He might be described as the "oral historian" of U.S. marine science. We hope he will be able to continue to serve the ocean sciences community in the future as well so that we can continue to benefit from his competence, his experience, and his concern for oceanography. But today, we honor him by presenting him with the Ocean Sciences Award.

Christopher N. K. Mooers
President
Joseph L. Reid
President-elect
Peter G. Brewer
Secretary
May 31, 1983

Chapman Conference on Natural Variations In Carbon Dioxide and the Carbon Cycle

January 9–13, 1984 Tarpon Springs, Florida
Convenors: E.T. Sundquist and W.S. Broecker

Natural Variations in Carbon Dioxide and the Carbon Cycle will bring together geologists who are studying various aspects of carbon cycle history; geochemical modelers; and biologists, oceanographers, and meteorologists who are familiar with present and potential future relationships among the carbon cycle, atmospheric CO_2, and climate.

CALL FOR PAPERS PUBLISHED IN *EOS*, JULY 19
ABSTRACT DEADLINE SEPTEMBER 15

Both invited and contributed papers will be allotted at least 30 minutes for each oral presentation. If there is sufficient demand, space and time will be made available for poster sessions.

For abstract format and meeting logistics information contact: AGU Meetings, 2000 Florida Avenue, N.W., Washington, DC 20009 (202) 462-6903.

For program information contact: E.T. Sundquist, U.S. Geological Survey, 431 National Center, Reston, VA 22092 (703) 860-6083.

Acceptance

To say that my emotions are "mixed" is an obvious understatement. I am completely and delightfully surprised. I am also a little bit embarrassed to be so honored by my friends, and I'm proud.

I am completely and thoroughly surprised particularly because my normally efficient intelligence network didn't provide even the slightest signal that this marvelous event was being prepared. Perhaps I should have been alerted when two different people asked me if I would be here today, but I knew they were speakers and thought their query to be merely part of their campaign to secure an audience.

Obviously it is a great honor to receive the Ocean Sciences Award from the American Geophysical Union Ocean Sciences Section, though while listening to the citation, with its catalogue of my accomplishments, I did start to wonder whether the authors know the same Dick Vetter that I know.

Looking back, and thanks in part to the award you have given me, I can honestly say that I am proud of my twenty five and one half years of service to you as the staff officer for the National Academy of Sciences' ocean science groups. There have been times in the past (particularly in the last few years) when I have wondered whether or not what I have done has made any difference, whether it has been important. You have helped me realize that it has mattered. Thanks. Now I am convinced of the truth of the quotation from Aristotle that is chiseled in the granite frieze along the top of the front wall of the National Academy of Sciences building (too bad that it's in Greek, so that most of us can't read it!). It translates as follows:

The search for Truth is in one way hard and in another easy. For it is evident that no one can master it fully nor miss it wholly. But each adds a little to our knowledge of Nature, and from all the facts assembled there arises a certain grandeur.

Aristotle
Metaphysics a. 1. 993a30–993b1

Richard C. Vetter

Second JECSS Workshop

The Second Japan and East China Seas Study (JECSS) Workshop, which was held April 22–27, 1983, at Tsukuba University, Japan, will publish proceedings in spring 1984. Convened by Takashi Ichiye (Texas A&M University) and Kenzo Takano (Tsukuba University), the purpose of the workshop was to assess oceanographic research of these seas, including modeling and observational techniques, and to promote the cooperation of oceanographers in studying the marginal seas. The Workshop was supported by IBM-Japan and the Japan Marine Science and Technology Center (JAMSTEC) and also sponsored by AGU, the Oceanographical Society of Japan and the Japanese-French Oceanographic Society. The JECSS program has been designated as a program that contributes to the objectives of WESTPAC, the IOC-UNESCO international program. JECSS-III will be convened in Japan in 1985 and the JECSS newsletter would be published quarterly by JAMSTEC.

This news item was contributed by Takashi Ichiye, *Department of Oceanography, Texas A&M University, College Station, TX 77843.*

Plan to Attend The AGU Chapman Conference on Magnetic Reconnection

October 3-7

Los Alamos National Laboratory
Los Alamos, New Mexico 87545

Convenor: E. W. Hones, Jr.

Magnetic Reconnection was identified 5 years ago, in a study sponsored by the NAS Space Science Board, as a problem vital to further understanding of space plasmas and having important implications beyond the study of solar system plasmas. The forthcoming conference examines our present understanding of magnetic reconnection as a physical process and our perception of its roles in planetary and stellar magnetospheres (particularly those of the earth and sun) and in laboratory and fusion research. Specifically, there will be sessions devoted to theory, modeling, earth's magnetosphere, the magnetotail (including talks on ISEE 3 observations in the distant tail), fusion research and astronomical objects (sun, comets, and Jupiter).

The registration fee, $65 ($32.50 for students), includes the conference banquet and picnic.

Some student travel funds still remain. To apply, write to Magnetic Reconnection Meeting, American Geophysical Union, 2000 Florida Avenue, N.W., Washington, DC 20009, giving your educational background and your research interests.

Write or telephone the convenor (505-667-4727) to obtain copies of the program, registration and housing forms, or other information. The deadline for housing reservations is September 9; the deadline for meeting registration is September 19.

News *(cont. from p. 537)*

goro 57, Bandung, Indonesia; Norman Banks, USGS Hawaiian Volcano Observatory, Hawaii Volcanoes National Park, HI 96718 USA; Michael Matson, Land Sciences Branch, NOAA/NESDIS, Room 307, Suitland Professional Center, Washington, DC 20233 USA; Jamie Hawkins, Otto Karst, and Sheldon Kusselson, Satellite Analysis Branch, NOAA/NESDIS, Room 401, 5200 Auth Road, Camp Springs, MD 20233 USA; Agence France Presse; Antara News Agency, Jakarta, Indonesia; United Press International.

Submarine volcano, off the W coast of New Britain Island, Papua New Guinea (5.2°S, 148.57°E). All times are local (= UT + 10 hours). The following is a report from C. O. McKee and P. de Saint Ours.

"An unnamed seamount, 30 km NNE of Cape Gloucester, W New Britain, may have been the site of a short-lived eruption on June 15–16.

"A subcontinuous swarm of long-period earthquakes was registered by several seismic stations in Papua New Guinea between 1913-2001 on June 15 and 0427–0450 on June 16. The swarm was recognized when the records were analyzed at Rabaul Volcano Observatory in early July. Preliminary determinations indicated shallow origins over a broad area at the W extremity of New Britain.

"Inquiries with the local people resulted in accounts of 'sounds like a jet plane coming from the sea, and glow in the sea a long distance from the coast.' Northeastward migration of the incandescence was also reported, possibly suggesting a fissure eruption.

"Airborne observations on July 28 failed to find water discoloration or any other evidence of the 6-week-old event.

"Until further information is obtained, the most likely source for these phenomena is a large seamount mapped in the general area of earthquake locations and visible reports."

Information Contact: C. O. McKee and P. de Saint Ours, Rabaul Volcano Observatory, P.O. Box 386, Rabaul, Papua New Guinea.

Earthquakes

Date	Time (UT)	Magnitude	Latitude	Longitude	Depth of Focus	Region
July 3	1714	6.1M_s	9.66°N	83.64°W	shallow	S Costa Rica
July 5	1112	6.4M_s	22.56°S	171.02°E	45 km	S Pacific Ocean
July 5	1201	5.7m_b	40.33°N	27.28°E	10 km	NW Turkey
July 11	1256	6.9M_s*	60.90°S	52.94°W	10 km	Scotia Sea
July 12	1510	6.5M_s	61.05°N	147.38°W	37 km	S Alaska, USA
July 21	0240	5.9m_b	36.19°N	120.39°W	10 km	Cent. California, USA

*7.0M_s, University of California, Berkeley

Information Contact: National Earthquake Information Service, U.S. Geological Survey, Stop 967, Denver Federal Center, Box 25046, Denver, CO 80225 USA.

Meteoritic Events

Fireballs: Burma-Thailand, England, Bay of Bengal, India, Indian Ocean, Italy (9), Illinois, mid-Atlantic, and Ohio, USA.

Books

Major Structural Zones and Faults of the Northern Appalachians

P. St-Julien and J. Béland (Eds.), *Spec. Pap. 24*, Geological Association of Canada, Waterloo, Ont., x + 280 pp., 1982, $24 (members), $29.

Reviewed by Edward S. Belt

This work, the first really important one to include a wide spectrum of views since the "Billings volume" of 1968, assesses the status of the geology of the Northern Appalachians. The terrains considered in a dozen articles occur in New England, Québec, and eastern Canada. This has been a region of intense research due to the rapid evolution of plate tectonic models as the geology has become better known.

The book is of considerable importance because nearly all the eminent researchers from the past decade have contributions in it and, unlike the Billings volume, the authors were asked to focus on major stratigraphic-tectonic terrains, their boundaries, and their regional context. As a consequence of this communality of purpose, most authors attempted regional evolutionary syntheses from their own perspective. The reader can thus construct a checklist of consensus and disagreement and, from that list, quickly ferret out areas for future research. The book's table of contents is shown at the end of this review in order to emphasize that the list of authors and the range of topics are impressive.

Nearly 20 years ago Hank Williams discerned a symmetry to the geology of Newfoundland which was to lead, in more recent years, to the definition of five tectono-stratigraphic zones throughout eastern Canada; eventually (about 5 years ago), they were traced into New England. The book considers (1) the boundaries between one zone and the next, (2) the nature and origin of these zones, (3) the regional extent of them and the possibility of new zones and cut-outs to the southwest, (4) the timing of events that affected the zones, and (5) the evolution of the Northern Appalachians according to the views of various authors.

The volume is divided into two parts: The first emphasizes structural zones or terrains, and the second concentrates on the nature of the boundaries between those zones. The consensus seems to be that the various terrains are separated one from the other by major transcurrent faults which in some cases, are perceived to be sutures between pieces of continental crust. Horizontal movement between terrains whose internal integrity remains relatively constant is the basic assumption upon which the evolutionary models are constructed. In some cases horizontal shifting of many kilometers is evoked. Vertical movement is minimal and confined to the production of mountains and basins that resulted in the thickness of strata observed. It all hangs together within the context of what is now known about the northern Appalachians.

There are some points of disagreement between various authors; these are mainly confined to the timing of closure of the Iapetus Ocean. Several suggest the evidence points to a Taconian time while most point to evidence in their terrain of an Acadian closure. Clearly the resolution of this controversy will be a focus of future research.

In general, the volume emphasizes pre-Acadian geology with only two authors attempting to deal with post-Acadian structures and events. Both of those attempts are somewhat restricted in scope or approach, with one author moving microcontinents thousands of kilometers to form Nova Scotia. Such inflated distances are not necessary: The Meguma Platform is not unique to North America. Very similar deposits of the same age are found in Wales and the Carolina slate belt, as was reported by Nick Rast at a recent Geological Society of America conference.

Clearly there is still much to be accomplished, and the editors have done a superb job of pulling together a coherent story for the region. This is one of the few books of collected research reports where the introduction is as important as one of the invited papers. It should be read by all serious geologists.

In summary, this book argues from the geology towards the plate tectonic models based on that geology, rather than the other way round, and for this reason ought to withstand the ravages of time.

GEODYNAMICS SERIES

Dynamics of Passive Margins
(1982), R.A. Scrutton (ed.), Illustrations, hardbound, 200 pp. $20

"This is an excellent compilation of current data and theories pertaining to the evolution of passive margins. Dynamics of Passive Margins is recommended to anyone with even peripheral interests in this line of investigation."

Christine Powell
Department of Geology
University of North Carolina

Continental and Oceanic Rifts
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Edward S. Belt is with the Department of Geology, Amherst College, Amherst, MA 01002.

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Jordan Gorrill Associates is a nationally recognized geotechnical consulting firm providing a wide range of services in geotechnical engineering, geology, hydrogeology, geophysics, and soil science. Send resume to: Director of Personnel, Jordan Gorrill Associates, subsidiary of E.C. Jordan Co., 562 Congress St./P.O. Box 7050, Portland, ME 04112. (207) 775-5525.

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Geology Department Head/University of Cincinnati. The Department of Geology is engaged in a nationwide search for a Department Head, with an anticipated starting date of September 1984. The position is open as to salary, rank and area of interest. A Ph.D. in Geology is required. We are seeking a person with an established reputation in geological sciences to administer our department and to share in its future development. We have a strong teaching and research orientation faculty of 14 people. The Department began granting the Ph.D. degree in 1950 and currently has 76 students in Ph.D. and M.S. Programs. There are 88 undergraduate majors. We have strong ties with industry, which is reflected in the level of financial support and career opportunities for our students. Send applications, resume and names of at least three professional references to:

John J. Alexander, Chairman
Geology Search Committee
Department of Chemistry
Mail Location 172
University of Cincinnati
Cincinnati, Ohio 45221

Closing date for the position is December 1, 1983.

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Geophysicist. New Mexico Institute of Mining and Technology invites applications for a tenure track position in explorations seismology at the assistant professor level to begin as soon as possible. The position will be a joint appointment between the College Division and the Research and Development Division. A PhD is required. Send letter of application, resume, brief description of teaching and research interest and names of three references to: Personnel, Brown Hall 17, New Mexico Institute of Mining and Technology, Socorro, NM 87801.

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Postdoctoral Research Associate Positions/Johns Hopkins University. Positions are available for studies of planetary magnetospheres, and for studies of earth magnetospheric and auroral physics, as well as in a newly initiated program in solar physics. Selected candidates will participate in the analysis and interpretation of data obtained from deep space probes (Voyager), on particle field, and solar or atmospheric emissions data from earth orbiting spacecraft. Positions are one year, renewable opportunities with flexible starting dates. Contact: Ned Aull, Department LPR-3202 The Johns Hopkins University Applied Physics Laboratory, Johns Hopkins Road, Laurel, Maryland 20707.

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University of Minnesota Stratigrapher/Sedimentary Petrologist. Tenure-track position starting Fall 1984, probably at the Assistant Professor level. The candidate must have a Ph.D. with interest in stratigraphy of sedimentary basins, tectonics and sedimentation, and sedimentary petrology, and will be expected to carry out research and to teach graduate and undergraduate courses in these fields. Please submit resume, academic records, and three letters of recommendation to Dr. Peter J. Hudleston, Department of Geology and Geophysics, 108 Pillsbury Hall, University of Minnesota, Minneapolis, MN 55455 (612)373-3575.

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The University of Missouri-Columbia/Faculty Positions. The University of Missouri-Columbia Department of Geology plans immediate expansion through the addition of three tenure-track faculty positions. Appointments are anticipated at the assistant professor level, although higher ranks may be possible, beginning in August of 1984. Candidates will be expected to have completed requirements for the Ph.D. degree by that time. Faculty members are required to provide quality instruction at both undergraduate and graduate level, and conduct research leading to scholarly publications. Successful candidates will be chosen from the following specialties:

Exploration Geophysics
Solid-Earth Geophysics
Hydrogeology
Analytical Structural Geology
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Applications should send resume, transcripts, and names and addresses of three references to:

Tom Freeman, Chairman
Department of Geology
University of Missouri
Columbia, MO 65211

Department of Geology/Southern Illinois University at Carbondale. Applications are invited for a tenure track position at the Assistant or Associate Professor Level starting in August, 1984.

Candidates must have the Ph.D. degree or expect completion by Fall 1984. Rank and salary are open depending upon qualifications and experience. We seek a candidate whose research and teaching interests are in the field of seismology. Persons with specific interests or experience in applied seismology, petroleum exploration or ore deposits are encouraged to apply. Duties will include undergraduate and graduate teaching supervision of theses, and development of a research program in the area of specialization.

Application deadline is December 2, 1983. Send letters to Lawrence L. Malinconico, Department of Geology, Southern Illinois University, Carbondale, IL 62901. Southern Illinois University at Carbondale is an equal opportunity employer.

Meteorologist/The City College of The City University of New York. The Department of Earth and Planetary Sciences invites applications for an anticipated opening in meteorology. The appointment will start September, 1984. Applicants should have completed the Ph.D. by the time of appointment and have a strong background in synoptic meteorology and computer applications. In addition, the individual should have an interest in atmospheric chemistry or pollution as applied to urban areas, or physical oceanography. The person hired will be required to teach courses in meteorology, and possibly physical oceanography as well as develop and maintain an active research program. Participation in the C.U.N.Y. Ph.D. Program in Earth and Environmental Sciences is anticipated. Rank and salary will be commensurate with experience. Send resume, transcripts and three letters of reference by November 30, 1983 to Professor Dennis Weiss, Chairman, Department of Earth and Planetary Sciences, the City College, 138 Street and Convent Avenue, New York, N.Y. 10031.

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Structural Geologist/University of Wyoming. The University of Wyoming, Department of Geology and Geophysics seeks applicants for a tenure track appointment in structural geology to be available beginning fall semester 1984 or earlier. Duties will include teaching of undergraduate and graduate courses in structural geology, supervising MS and PhD theses, and research in structural geology. Appointment at assistant professor level is preferred, but applicants requesting appointment at higher rank will be considered. Applicants must have a PhD degree and be versed in quantitative theory as well as field applications of modern structural geology and regional tectonics.

Applicants should provide a resume, names of three references and a letter of application including a statement of current research interests and courses which the applicant feels qualified to teach. Applications should be sent to: Dr. Robert S. Houston, Department Head, Department of Geology/Geophysics, PO Box 3006 University Station, Laramie, WY 82071.

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RESEARCH POSITIONS AVAILABLE

The Lunar and Planetary Institute is a center for Planetary and Earth Science research associated with NASA programs. The Institute presently has 2 to 3 positions available at the postdoctoral and staff scientist levels. Appointments are initially for one year with the possibility of renewal for additional years.

Areas of current research interest at the Institute include: geophysical analysis of global data sets; planetary geology, including the analysis of surface images and theoretical and experimental studies of impact cratering; terrestrial remote sensing with special reference to volcanic phenomena; planetary tectonics, especially of Mars, Venus and the Earth; and the early crustal genesis of terrestrial planets.

Applications from specialists in all areas of planetary and earth science are invited and will be particularly welcome from researchers whose work augments or complements existing programs.

LPI facilities include a computer center equipped with a VAX 11/780, an image processing facility equipped with a Gould/DeAnza IP 8500, a geophysical data facility with interactive graphics capability, extensive library holdings in the geosciences, and a major collection of space photography.

The LPI, funded by NASA through the Universities Space Research Association, is located adjacent to the NASA/Johnson Space Center near Houston. Salary and benefits are competitive and attractive and depend on individual qualifications. Respond before Sept. 30, 1983 to:

Director's Office, LPI
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Hydrogeologist, Hydrologist, or Water Resources Planner. The Kansas Geological Survey, a division of The University of Kansas, solicits applications for a hydrogeologist, hydrologist, or water resources planner. Permanent, full-time position subject to annual review. Salary Range: $20,000–$30,000 per year, depending on qualifications. Required qualifications: Master's degree in hydrogeology, hydrology, or related water resources field. Course work in theoretical hydrologic modeling and capability to apply these models to different hydrologic and water planning problems to particular areas in Kansas. Preferred qualifications: Ph.D. degree in one of the above fields, and 2–3 years of research experience in water resources related studies.

Freedom to conduct research within the framework of the KGS Geohydrology Section's programs and support of a university environment. Opportunity for graduate study or teaching; and fully funded research opportunities in excellent research facilities.

Contact Personnel Manager, Kansas Geological Survey, 1930 Constant Avenue, Campus West, The University of Kansas, Lawrence, Kansas 66044 (Ph. 913/864-3965) for full position description, or to apply, send resume, college transcripts, list of published research, and three letters of reference. Priority will be given to applications received by October 31, 1983. Applications will be accepted and reviewed every thirty days thereafter until the position is filled.

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Faculty Position Available/Massachusetts Institute of Technology. The Department of Earth, Atmospheric, and Planetary Sciences at M.I.T. is seeking to fill a faculty position in seismology. Applicants should preferably have an interest and ability in theoretical seismology, and would be expected to supervise graduate students and teach courses at the undergraduate and graduate level as well as conduct research in that field. Rank is open and depends upon qualifications.

Applicants should send their vitae, list of publications, and a statement of research and teaching interests, no later than 1 November 1983 to:

Prof. W. F. Brace, Chairman
Department of Earth, Atmospheric, and Planetary Sciences
54-918, M.I.T.
Cambridge, MA 02139

M.I.T. is an Equal Opportunity/Affirmative Action Employer.

Postdoctoral Research Associate/University of New Hampshire. Magnetospheric Physicist to analyze ULF data collected in Antarctica and at a conjugate site in Canada. An opportunity to correlate the data with other ground observatories and satellite data for wave-particle interaction studies exists. Must have had some experience in ULF and be willing to travel to the Antarctic during the Austral summer. Position available January 1984 at the earliest, salary $13,020 to $21,320; starting salary normally not to exceed $15,540.

Send resume and names of three references no later than October 15 to: Dr. Roger Arnoldy, Physics Department, Demeritt Hall, University of New Hampshire, Durham, New Hampshire 03824.

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Tenure-Track Faculty Position-Geophysics/New Mexico State University. We are seeking a faculty member whose duties will include teaching both undergraduate and graduate level courses, conducting research and supervising graduate level thesis and dissertation research. We are particularly interested in a seismologist, but persons with experience in other geophysical techniques are invited to apply.

Minimum qualifications include an earned doctorate in geophysics or a closely related area and demonstrated research capability. Teaching experience and demonstrated ability to secure research funding are desirable. The position is available in January 1984 for 9-month academic year. Appointment will be at the rank of Assistant or Associate Professor. Salary and academic rank will be dependent on experience and qualifications.

Applications and names, addresses and telephone numbers of at least three references should be submitted to Dr. Chandler Swanberg, Department of Earth Sciences, P.O. Box 3AB, Las Cruces, NM 88003.

Applications received by October 15, 1983 will be given preference.

New Mexico State University is an Affirmative Action/Equal Opportunity Employer.

Professor of Marine Geophysics Tectonics/Stanford University. The Department of Geophysics, Stanford University, is seeking candidates for a tenure track position in the broad area of marine geophysics and tectonics. We seek a creative scientist with experience in gathering, interpreting, and synthesizing marine geophysical data and whose research interests cover depositional, igneous, and tectonic processes on oceanic plates and continental margins. Inquiries are invited from marine geophysicists with demonstrated scientific record in one of the above aspects of marine geophysics or tectonics, who have demonstrated an ability to develop new ideas and research directions, and to guide and teach graduate and undergraduate students. In considering this appointment we are interested in maximizing interactions with ongoing research groups in marine geology, plate tectonics, paleomagnetism, seismology and regional geology at Stanford. Our new faculty member will be expected to develop a strong research program involving both government and industrial participation.

Salary and rank will be commensurate with experience and background. Please submit a resume, a brief description of teaching and research interests, and references to:

Dr. Amos Nur
Department of Geophysics
521 Mitchell Building
Stanford University
Stanford, CA 94305

Stanford University is an equal opportunity employer, and encourages the application of qualified women and minorities.

Iowa State University of Science and Technology, Department of Earth Sciences. Applications are invited for a tenure track faculty position in Meteorology. Rank is at the assistant or associate professor level, dependent upon qualifications. The successful applicant will be expected to develop a strong research and graduate student program and will teach undergraduate and graduate courses for meteorology majors.

The position is for a person with proven expertise within the general area of dynamic meteorology. Teaching will involve an undergraduate course in synoptic meteorology, in addition to courses related to the field of expertise. Completion of the Ph.D. prior to appointment is strongly preferred. In addition, research ability shown by other publications and/or postdoctoral experience will be an advantage.

Iowa State offers degrees in meteorology through the Ph.D. The program includes about 60 undergraduate majors; the graduate/research program is strong and emphasizes theoretical, dynamic studies. Close relationships are established with the facilities and personnel of major national laboratories. New campus facilities for meteorology are currently under construction.

The appointment is expected to begin no later than September, 1984; an appointment during the current academic year may be possible. Application deadline is November 1, 1983; later applications will be accepted if the position is not filled. For application information please write to:

Dr. Ben E. Nordlie
Department of Earth Sciences
Iowa State University
253 Science I
Ames, Iowa 50011.

Iowa State University is an equal opportunity/affirmative action employer.

Earth Sciences

The Lamont-Doherty Geological Observatory of Columbia University invites scientists interested in any field of the earth sciences to apply for the following fellowships: Two postdoctoral fellowships, each awarded for a period of one year (extendable to two years in special instances) beginning in September, 1984 with a stipend of $25,000 per annum.

Completed applications are to be returned by January 15, 1984. Application forms may be obtained by writing to the Director, Lamont-Doherty Geological Observatory, Palisades, New York 10964. Award announcements will be made February 28, 1984, or shortly thereafter.

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The journal **Pure and Applied Geophysics (PAGEOPH)** is undergoing major changes. As of January 1983 its newly established editorial board will operate on a three-year basis, and **PAGEOPH** will be published by the US-based Birkhäuser Boston, Inc. Keiiti Aki is the new Editor-in-Chief, assisted in atmospheric and oceanic science by Richard Lindzen. Renata Dmowska serves as Executive Editor. At present the editorial board consists of:

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The new editorial board plans to preserve the international character of the journal, simultaneously ensuring the highest standards through a vigorous effort to publish papers of interest and quality. The **PAGEOPH** tradition of special issues will be further developed. These special issues serve as both state-of-the-art surveys and as introductions to active areas of research. They will be published in regular journal format, and also in inexpensive softcover editions. All page charges for contributions in these special issues will be dropped. There are no page charges for the first 12 pages of any contribution accepted for regular publication in **PAGEOPH**.

The new editorial board has been chosen to be rather equally divided between atmospheric and solid earth scientists. Management and editorial policies will reflect this dual specialization, with the eventual possibility of separate issues. Subscribers can be assured of thought-provoking, current research in both fields of geophysical science.

The call for papers is being announced. Manuscripts in solid earth science should be submitted to:

Dr. Renata Dmowska, Executive Editor
Division of Applied Sciences
Harvard University
Pierce Hall
29 Oxford Street
Cambridge, MA 02138 USA

Manuscripts in atmospheric and oceanic sciences should be submitted directly to an editor of your choice. Acceptance or rejection by the editorial board is final. All manuscripts should be submitted in triplicate, typewritten with double line spacing and wide margins. Detailed guidelines for contributors can be found in each issue of **PAGEOPH**.

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PAGEOPH
pure and applied geophysics

Chairman-Department of Geological Sciences/Wright State University. The Department of Geological Sciences invites applications for the position of chairman to be appointed September 1984. We seek a dynamic individual with administrative talent and an appreciation for research and practice-related educational activities. Rank is at the full professor level and no restrictions have been placed on areas of specialization. The department is active with 12 faculty and an emphasis on professional practice, yet maintaining a firm commitment to basic research.

Send a letter of application, curriculum vitae and names of three references to:

Chairman, Search Committee
Department of Geological Sciences
Wright State University
Dayton, OH 45435

Wright State University is an affirmative action/equal opportunity employer. Closing date for the position is October 31, 1983.

Rensselaer Polytechnic Institute/A Tenure-Track Faculty Position and a Post-Doctoral Research Position. The Department of Geology of Rensselaer Polytechnic Institute is seeking applicants for two openings, a tenure-track faculty position and a post-doctoral research position.

The faculty position available in September 1984 requires a Ph.D. or equivalent degree. The area of specialization within the geosciences is open. Particularly important is the applicant's interest in research and teaching at both the undergraduate and graduate levels (M.S. and Ph.D.) with capability to do creative research in the quantitative sciences. Preference will be given to individuals with research experience beyond the Ph.D.; the level of the appointment is open.

The postdoctoral position is available beginning January 1984 to do research in the field of fission track analysis applied to studies of sedimentary basins. Applicants must be knowledgeable and experienced in fission track analysis.

Our present department is part of a modern, technologically-oriented university, and consists of seven members whose collective expertise encompasses structural geology, geophysics, geochemistry, petrology, glacial and surficial geology, and ecological modeling. The RPI environment provides ample opportunities for field and laboratory experimental research in geology, as well as for interdisciplinary studies in chemistry, physics, biology, mathematics, materials science, engineering and computer science.

A resume and the names of three persons who would be willing to provide letters of reference should be sent to: Donald S. Miller, Chairman, Department of Geology, Rensselaer Polytechnic Institute, Troy, NY 12181.

Rensselaer is an Equal Opportunity/Affirmative Action Employer.

Mass Spectrometry/Washington University. The Department of Earth and Planetary Sciences of Washington University in St. Louis has an opening for a mass spectrometry specialist in a recently established thermal emission mass spectrometry laboratory. This position will involve responsibilities for the operation and maintenance of the laboratory as well as opportunities for collaborative and independent research in isotope geochemistry. A Ph.D. in physical science and prior experience in thermal emission spectrometry are highly desirable. Closing date for applications is September 15. Send to F.A. Podosek, Department of Earth and Planetary Sciences, Washington University, St. Louis, MO 63130.

Washington University is an equal opportunity/affirmative action employer.

SERVICES, SUPPLIES, COURSES, AND ANNOUNCEMENTS

The University of California at Berkeley/Space Sciences Laboratory Senior Fellow Program. Renewable three-year appointments will be awarded to Ph.D. scientists who have demonstrated leadership and creativity in astrophysics or space science. Fellows will receive Principal Investigator status and will be expected to develop their own research groups and participate in educational activities of the academic departments. The level, to be determined at the time of appointment, will be Assistant, Associate, or Full Research Scientist depending upon qualifications.

Vita, bibliography, statement of prospective research program and three letters of reference should be sent by December 1, 1983 to Christopher McKee, Acting Director, Space Sciences Laboratory, University of California, Berkeley, California 94720.

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Housing and registration forms were published in Eos, August 2

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For more information contact . . . AGU Meetings,
2000 Florida Avenue, N.W.,
Washington, D.C. 20009
(202) 462-6903

AGU

Jack D. Fellows: Congressional Science Fellow

Jack D. Fellows has been selected as the 1983–84 AGU Congressional Science Fellow. Last week he began his 1-year stint on Capitol Hill as AGU's seventh Congressional Science Fellow.

Fellows received his Ph.D. earlier this year from the civil engineering department at the University of Maryland, College Park. For his dissertation he developed a management system using regional geographic information for hydrologic models. His work applied remote sensing data to the decision-making processes of regional planning organizations concerned with hydrology and natural resource management. The Maryland National Capital Park and Planning Commission has integrated Fellows' work into their programs on water resource and environmental planning; his approach also is being used for forest and water resource planning near Freiburg, Baden-Wurtemberg, West Germany.

As the AGU Congressional Fellow, Fellows said he is interested in "examining and experiencing the procedures, power, and interactions of the executive branch [of government], Congress, lobbyists, constituents, and special-interest groups during the life-cycle of legislation." He anticipates contributing to legislation on the environment, agriculture, public works, land use, and remote-sensing satellites. "I believe I can be of value on legislation concerning various topics in civil engineering, hydrology, environmental planning, image processing, and computer science," Fellows said.

His professional interests include the application of remotely sensed data to water resources problems; the use of remotely sensed data in planning and forecast models and in regulatory enforcement; the application of image processing techniques and of database management principles to remotely sensed data; and computer graphics.

Fellows received his B.S. and M.S. degrees in civil engineering from the University of Maryland. While at Maryland, he worked as a faculty research assistant in the Remote Sensing Systems Laboratory. He also was a faculty research engineer, a graduate research assistant, and an instructor/teaching assistant. He joined AGU's Hydrology section as a student member in 1981.

The AGU Congressional Science Fellow program is one of about 20 professional society programs that make up the American Association for the Advancement of Science (AAAS) Congressional Science and Engineering Fellows program. This program involves scientists and engineers in making public policy within Congress through work on members' staffs, on congressional committee staffs, or in some other area of Congress.—*BTR*

AGU Congressional Science Fellowship

The individual selected will spend a year on the staff of a congressional committee or a House or Senate member, advising on a wide range of scientific issues as they pertain to public policy questions.

Prospective applicants should have a broad background in science and be articulate, literate, flexible, and able to work well with people from diverse professional backgrounds. Prior experience in public policy is not necessary, although such experience and/or a demonstrable interest in applying science to the solution of public problems is desirable.

The fellowship carries with it a stipend of up to $28,000, plus travel allowance.

Interested candidates should submit a letter of intent, a curriculum vitae, and three letters of recommendation to AGU. For further details, write Member Programs Division, American Geophysical Union, 2000 Florida Avenue, N.W., Washington, D.C. 20009 or telephone 462-6903 or 800-424-2488 outside the Washington, D.C., area.

Deadline: March 31, 1984

Meetings

Announcements

Lightning Conference

The deadline for submitting abstracts to the 1984 International Conference on Lightning and Static Electricity is October 3, 1983. Organizers of the conference, scheduled for June 26–28, 1984, in Orlando, Fla., are soliciting papers on phenomenology, channel modeling and coupling analysis, hardening of airborne and ground equipment, lightning test criteria and techniques, effects of lightning on electrical and electronic systems, grounding and bonding, and protection of aircraft.

The 300–400 word abstracts, in English, should be sent to J. J. Fisher, Conference Chairman, U.S. Naval Air Systems Command, P.O. Box 15036, Arlington, VA 22215 (telephone: 202-692-7822). Abstracts and technical inquiries from Europe should be directed to G. Odam, European Coordinator, Royal Aircraft Establishment, Farnborough, Hants, GU14 5TD UK (telephone: 0252–24461, ext. 2638). Authors of accepted papers will be asked to submit a camera-ready copy of their article for publication in the conference proceedings.

The conference is being sponsored by several military and civilian air transportation agencies in the United States and in the United Kingdom as well as by the National Oceanic and Atmospheric Administration, the Institute of Electrical and Electronics Engineers, and the SAE-AE4 Committee.

Mid-Atlantic Bight

The 11th Annual Middle Atlantic Bight Physical Oceanography and Meteorology (MABPOM) Workshop will be held at the Lamont-Doherty Geological Observatory in Palisades, N. Y., October 19–20, 1983. For more information on this informal gathering of oceanographers and meteorologists working in the Middle Atlantic Bight region, contact Frank Aikman IV, Lamont-Doherty Geological Observatory, Palisades, NY 10964 (telephone: 914-359-2900, ext. 259).

Urban Water

A conference on Urban Effects on Water Quality and Quantity will be held October 20–21, 1983, in Urbana, Ill. The conference will deal with federal and state perspectives on urban stormwater issues and with new research relevant to urban water problems in the Midwest.

The preliminary program includes reports on urban runoff and combined sewer overflows as they affect streams, lakes, and sediment chemistry, and on how runoff and overflow can be cleansed, controlled, predicted, and measured.

The conference will also include sessions on the results of the Environmental Protection Agency's (EPA) Nationwide Urban Runoff Program (NURP) and the U.S. Geological Survey's (USGS) Urban Studies Program. NURP is a multiyear project in which 28 studies examine the origin of pollutants in urban stormwater runoff, the impact of urban stormwater on receiving streams, and the effectiveness of management practices in controlling stormwater pollution. In the USGS Urban Studies Program, data for water quality and quantity are being collected from more than 150 urban sites. EPA, USGS, the Illinois Section of the American Water Resources Association, the Water Resources Center of the University of Illinois, and four Illinois state agencies are sponsoring the conference.

For more information contact Glenn E. Stout, Director, Water Resources Center, 2535 Hydrosystems Laboratory, University of Illinois, 208 Romine Street, Urbana, IL 61801 (telephone: 217-333-0580).

Wastewater Seminar

A seminar on the Enhanced Biological Removal of Phosphorus from Wastewater will be held in Paris September 24–25, 1984. This gathering is an offshoot of the 12th Biennial Conference of the International Association on Water Pollution Research and Control to be held in Amsterdam September 17–20, 1984, and is a follow-up to a similar post-conference seminar held in Pretoria in April 1982.

Seminar discussions will deal with the removal of phosphorus from wastewater by biological means in terms of microbiology; chemistry and biochemistry; pilot-scale studies; full-scale studies; treatment, handling, and disposal of phosphate-rich sludge; and research and development needs.

Authors interested in presenting papers at the seminar should submit a 500-word abstract in English by December 15, 1983, to Michel Florenz, Phosphorus Seminar, Anjou-Recherche, 52, rue d'Anjou, 75384 Paris Cedex 08, France (telephone: 266–91–50; telex: Geneaux 280 352 F). All contributions must be original and must be presented by the authors. Accepted papers will be published.

Geophysical Year

New Listings

The complete Geophysical Year list appeared in the August 30, 1983, *Eos*.

A boldface meeting title indicates sponsorship or cosponsorship by AGU.

New Listings

Oct. 20–21, 1983 Conference on Urban Effects on Water Quality and Quantity, Urbana, Ill. Sponsors, EPA, USGS, AWRA, Water Resources Center of Univ. of Illinois, and four Illinois state agencies. (Glenn E. Stout, Director, Water Resources Center, 2535 Hydrosystems Laboratory, Univ. of Illinois, 208 Romine St., Urbana, IL 61801; tel.: 217-333-0536.)

May 29-June 1, 1984 Joint Meeting: 18th Annual Congress of the Canadian Meteorological and Oceanographic Society (CMOS) and 11th Annual Meeting of the Canadian Geophysical Union (CGU), Halifax, Nova Scotia, Canada. (S. D. Smith (CMOS) or H. R. Jackson (CGU); Bedford Institute of Oceanography, P.O. Box 1006, Dartmouth, N.S. B2Y 4A2, Canada.)

June 26–28, 1984 1984 International Conference on Lightning and Static Electricity, Orlando, Fla. Sponsors, NOAA, IEEE, SAE-AE4 Committee, and several military and civilian air transportation agencies in U.S. and U.K. (J. J. Fisher, Conference Chairman, U.S. Naval Air Systems Command, P.O. Box 15036, Arlington, VA 22215; tel.: 202-692-7822; or G. Odam, European Coordinator, Royal Aircraft Establishment, Farnborough, Hants, GU14 5TD U.K.; tel.: 0252-24461, ext. 2638.)

Aug. 13–16, 1984 20th Annual Water Resources Conference. Washington, D. C. Sponsor, AWRA. (Arlene Dietz, U.S. Army Corps of Engineers, Institute for Water Resources, Casey Bldg., Fort Belvoir, VA 22060; tel.: 202-325-6768.)

AGU FALL MEETING
The City by the Bay
December 5–10, 1983
San Francisco, California

ABSTRACT DEADLINE SEPT. 14

Call for Papers (including abstract specifications) was published in *Eos*, June 28 and July 26

For more information, write:
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1 WEEK